FIG.1 FIG.3 FIG.8

10 LED DRIVING DEVICE

11 R APPLIED VOLTAGE STORAGE REGISTER

12 G APPLIED VOLTAGE STORAGE REGISTER

13 B APPLIED VOLTAGE STORAGE REGISTER

15 REGISTER SELECTING CIRCUIT

17 DA CONVERTING CIRCUIT

18 VOLTAGE VARYING CIRCUIT

19 POWER SUPPLY VOLTAGE GENERATING CIRCUIT

21 R DUTY RATIO STORAGE REGISTER

22 G DUTY RATIO STORAGE REGISTER

23 B DUTY RATIO STORAGE REGISTER

24 25 26 PWM WAVEFORM FORMING CIRCUIT

FIG.2

MINIMUM VALUE STANDARD VALUE MAXIMUM VALUE

RED LED GREEN LED BLUE LED

UNIT

FIG.3

30 DRIVING VOLTAGE SETTING DEVICE

31 LUMINANCE/CHROMATICITY METER

32 MICROCOMPUTER

33 APPLIED VOLTAGE SETTING SECTION

34 DUTY RATIO SETTING SECTION

40 LCD PANEL

FIG.4

ST10 START

ST11 SET ON DUTY RATIOS R: MAXIMUM

ST12 SET THE TARGET LUMINANCE

ST13 APPLY VOLTAGE Vmin

ST14 MEASURED LUMINANCE>TARGET LUMINANCE ?

ST16 STORE THE APPLIED VOLTAGE VALUE

ST17 MEASURED LUMINANCE=TARGET LUMINANCE ?

ST19 STORE THE ON DUTY RATIOS

ST20 END

FIG.5

ST30 START

ST31 LIGHT AN LED OF EACH COLOR WITH STORED APPLIED VOLTAGE AND DUTY RATIO· DRIVE THE LIQUID CRYSTAL

ST32 MEASURE THE CHROMATICITY

ST33 Y COORDINATE IS IN AN ALLOWABLE RANGE ?

ST34 X COORDINATE IS IN AN ALLOWABLE RANGE ?

ST35 VARY THE DUTY RATIO

ST36 WRITE THE DUTY RATIO

ST37 END

FIG.6

ELEMENT CHROMATICITY RANGE

Green LED DISTRIBUTION RANGE

Blue LED DISTRIBUTION RANGE

Red LED DISTRIBUTION RANGE

RGB PWM VALUE FINE ADJUSTMENT DIRECTION

WHITE ALLOWABLE RANGE

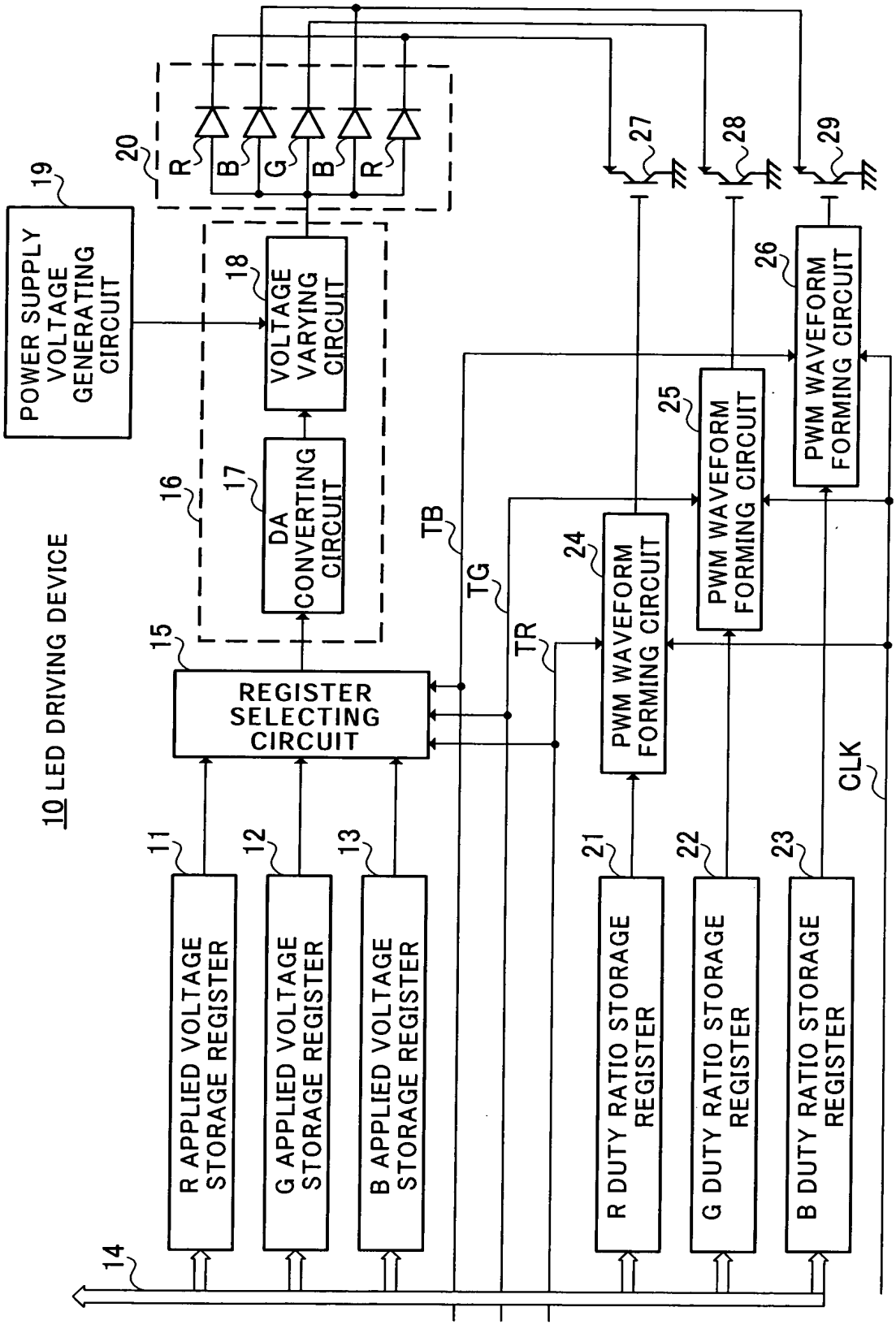

FIG.1

	MINIMUM VALUE	STANDARD VALUE	MAXIMUM VALUE
RED LED	1.75	2.2	2.45
GREEN LED	2.9	3.3	3.9
BLUE LED	2.9	3.4	3.9

UNIT :V

FIG.2

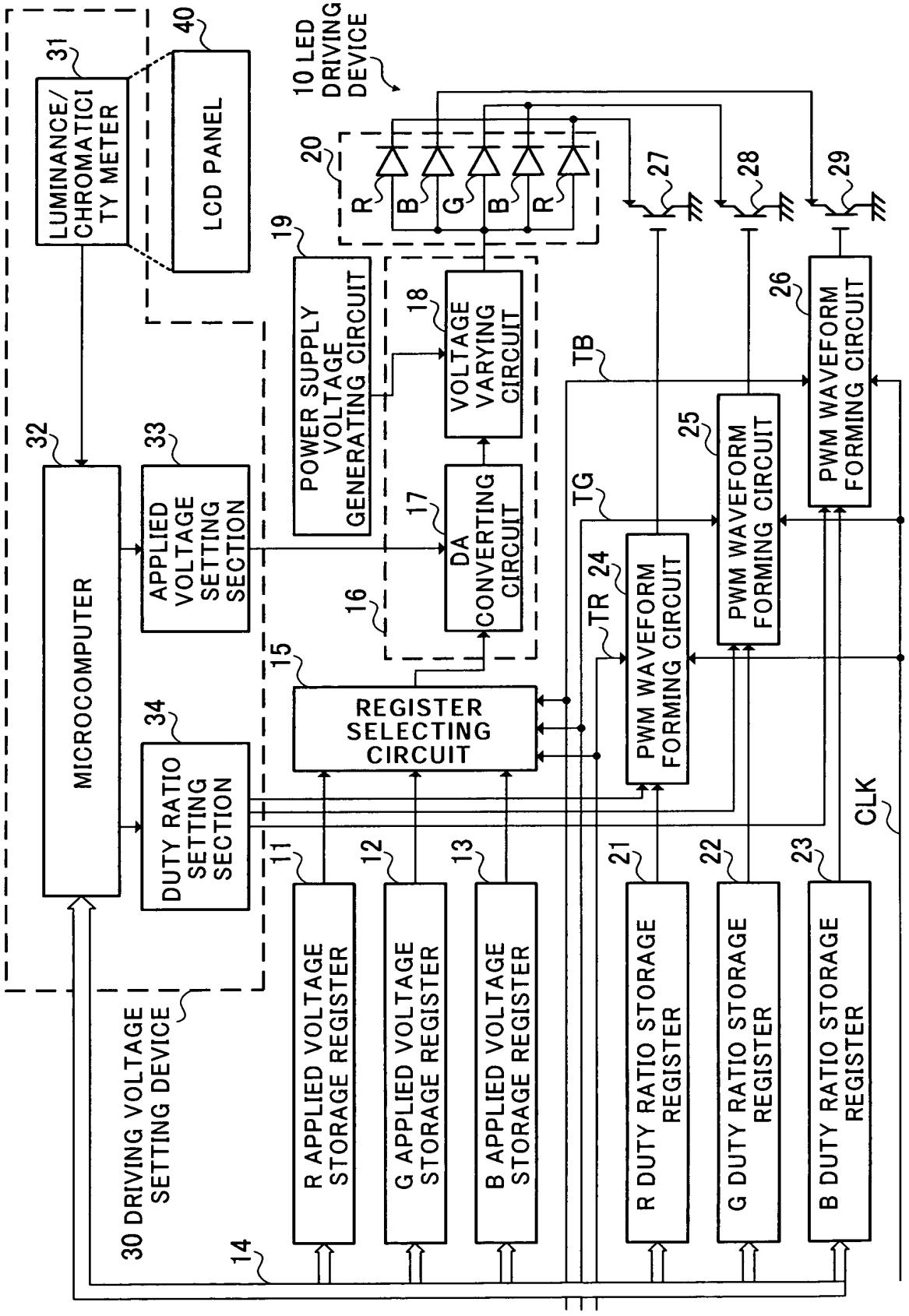
10 LED DRIVING DEVICE
LUMINANCE/ CHROMATICITY METER
31
LCD PANEL
40
20
R
B
G
B
R
27
28
29
19
POWER SUPPLY VOLTAGE GENERATING CIRCUIT
18
VOLTAGE VARYING CIRCUIT
26
PWM WAVEFORM FORMING CIRCUIT
TB
32
MICROCOMPUTER
33
APPLIED VOLTAGE SETTING SECTION
17
DA CONVERTING CIRCUIT
TG
25
PWM WAVEFORM FORMING CIRCUIT
16
TR
24
PWM WAVEFORM FORMING CIRCUIT
15
REGISTER SELECTING CIRCUIT
34
DUTY RATIO SETTING SECTION
CLK
11
12
13
21
22
23
R APPLIED VOLTAGE STORAGE REGISTER
G APPLIED VOLTAGE STORAGE REGISTER
B APPLIED VOLTAGE STORAGE REGISTER
R DUTY RATIO STORAGE REGISTER
G DUTY RATIO STORAGE REGISTER
B DUTY RATIO STORAGE REGISTER
30 DRIVING VOLTAGE SETTING DEVICE
14

FIG.3

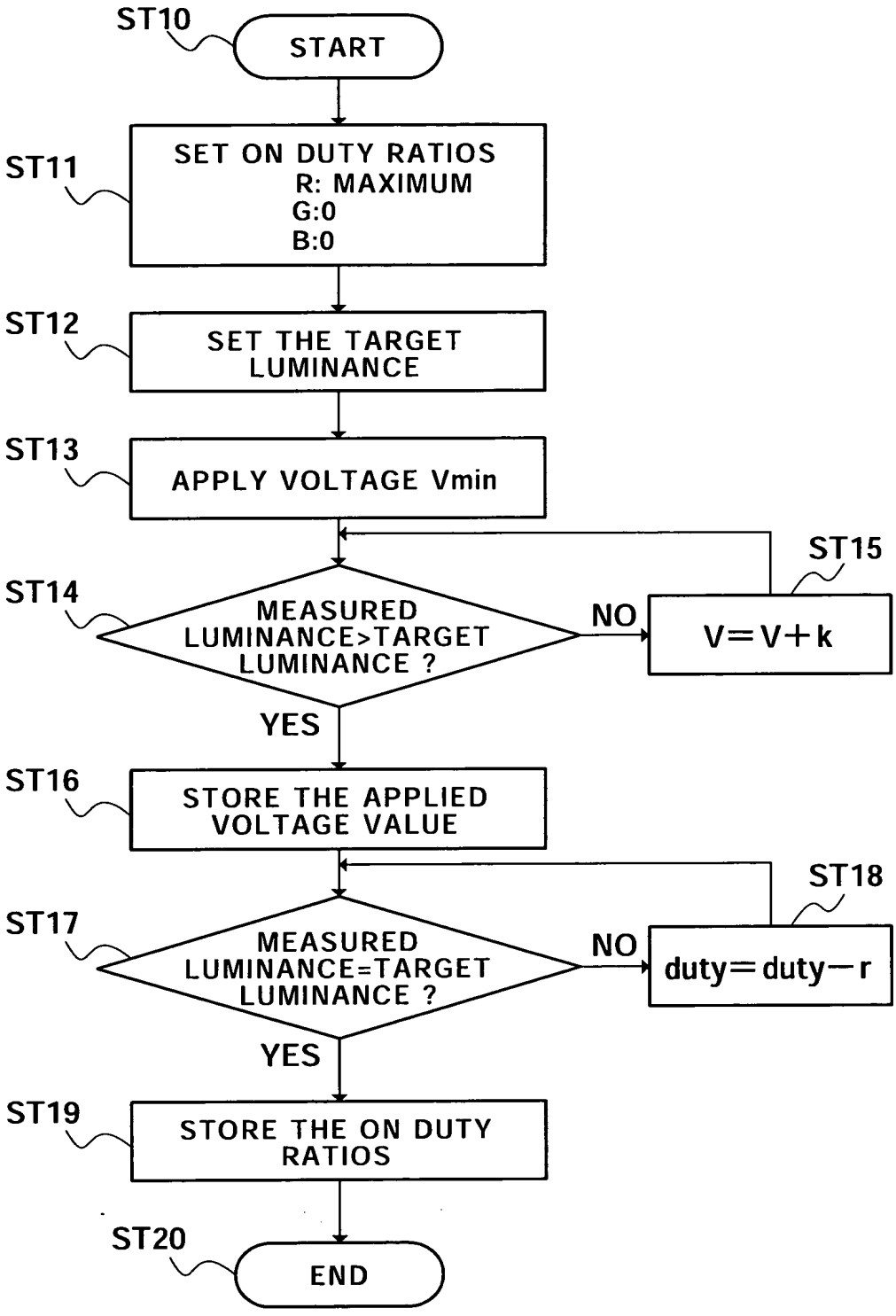
ST10
START
ST11
SET ON DUTY RATIOS
R: MAXIMUM
G:0
B:0
ST12
SET THE TARGET LUMINANCE
ST13
APPLY VOLTAGE Vmin
ST15
ST14
MEASURED LUMINANCE>TARGET LUMINANCE ?
NO
V=V+k
YES
ST16
STORE THE APPLIED VOLTAGE VALUE
ST18
ST17
MEASURED LUMINANCE=TARGET LUMINANCE ?
NO
duty=duty−r
YES
ST19
STORE THE ON DUTY RATIOS
ST20
END

FIG.4

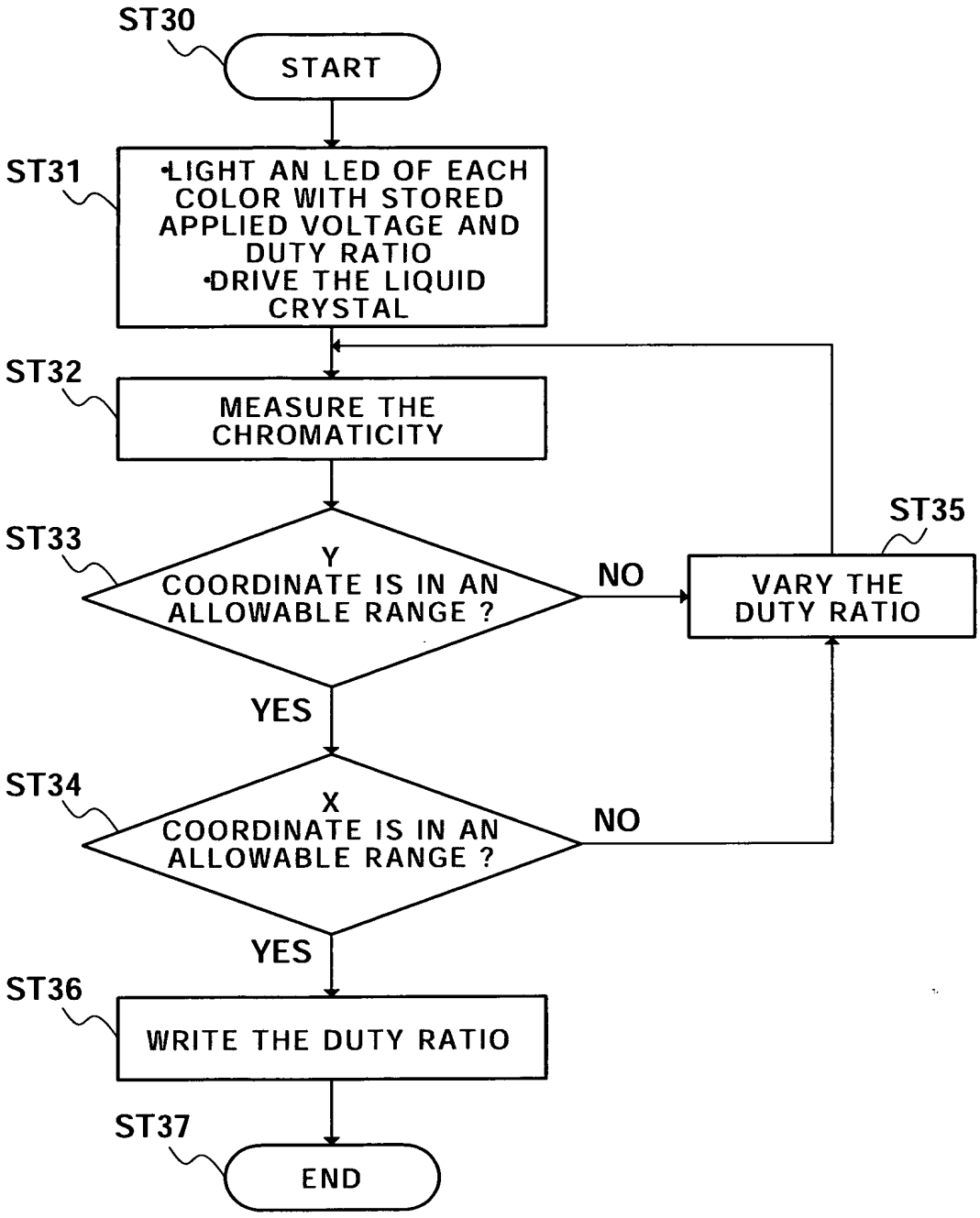
ST30
START
ST31
•LIGHT AN LED OF EACH COLOR WITH STORED APPLIED VOLTAGE AND DUTY RATIO
•DRIVE THE LIQUID CRYSTAL
ST32
MEASURE THE CHROMATICITY
ST33
Y COORDINATE IS IN AN ALLOWABLE RANGE ?
NO
ST35
VARY THE DUTY RATIO
YES
ST34
X COORDINATE IS IN AN ALLOWABLE RANGE ?
NO
YES
ST36
WRITE THE DUTY RATIO
ST37
END

FIG.5

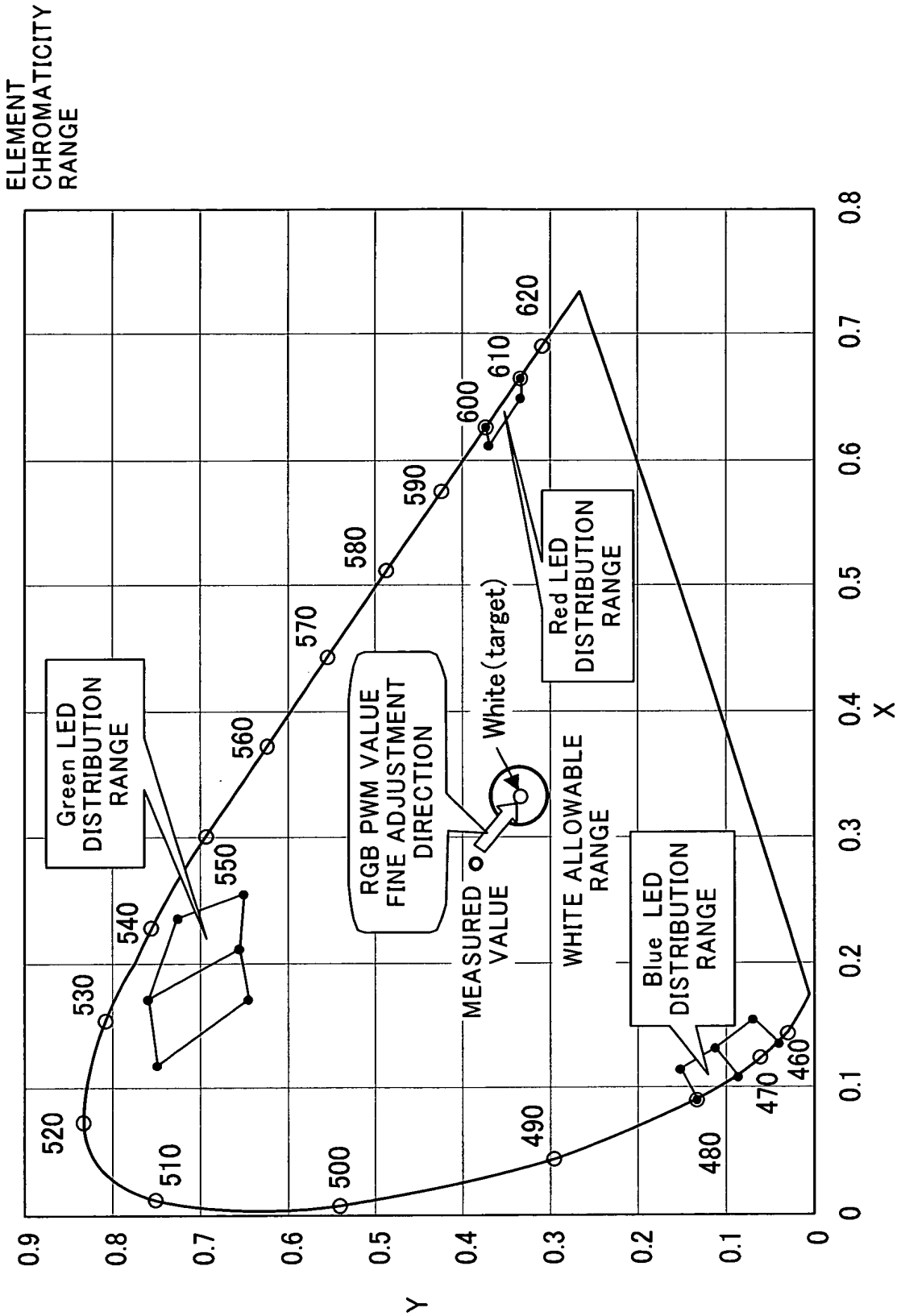
ELEMENT CHROMATICITY RANGE
Green LED DISTRIBUTION RANGE
Red LED DISTRIBUTION RANGE
Blue LED DISTRIBUTION RANGE
RGB PWM VALUE FINE ADJUSTMENT DIRECTION
MEASURED VALUE
White (target)
WHITE ALLOWABLE RANGE
520
530
540
550
560
570
580
590
600
610
620
510
500
490
480
470
460
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Y
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
X

FIG.6

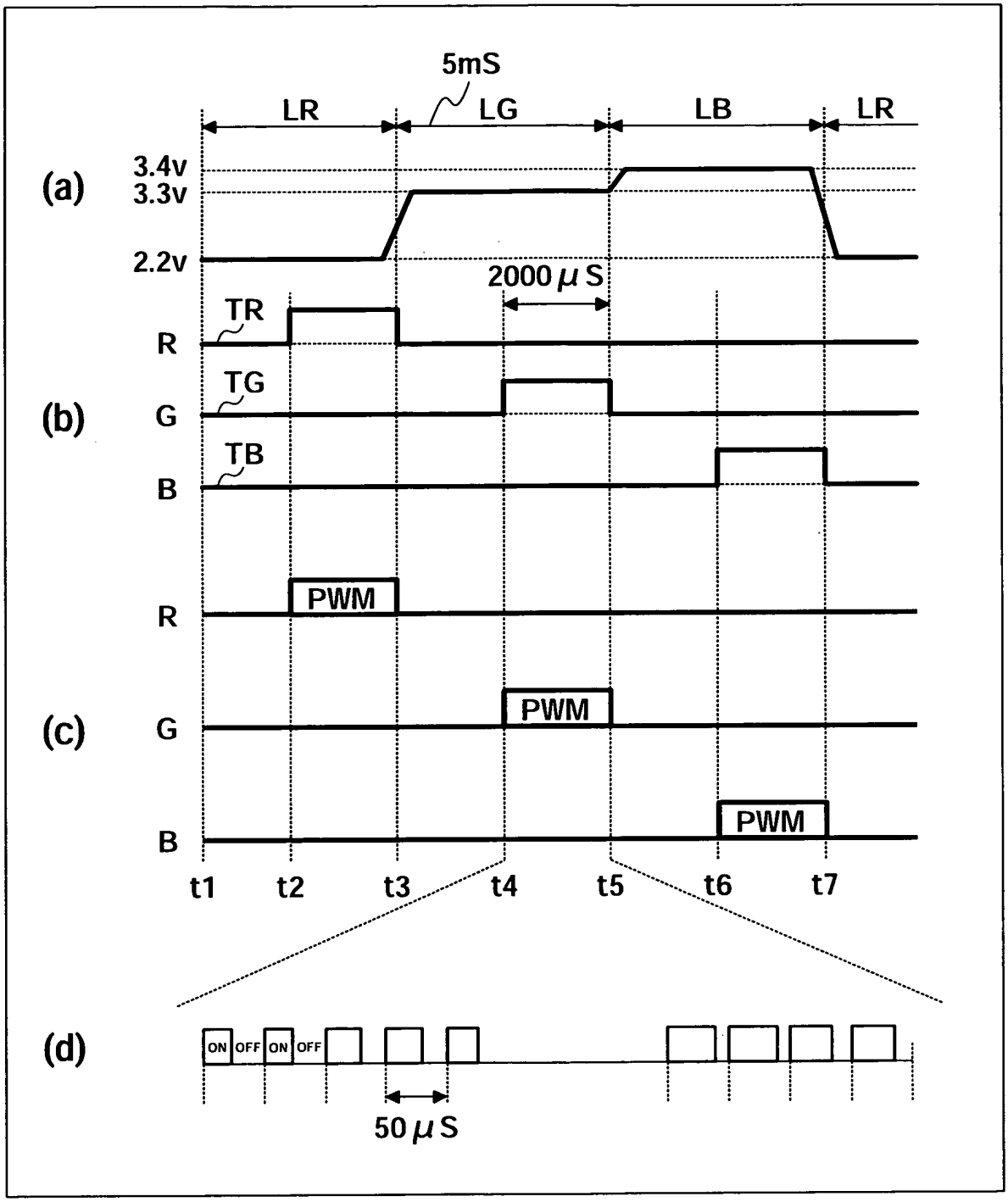
5mS
LR
LG
LB
LR
(a)
3.4v
3.3v
2.2v
2000 μ S
TR
R
TG
(b)
G
TB
B
R
PWM
G
(c)
PWM
B
PWM
t1
t2
t3
t4
t5
t6
t7
(d)
ON
OFF
ON
OFF
50 μ S

FIG.7

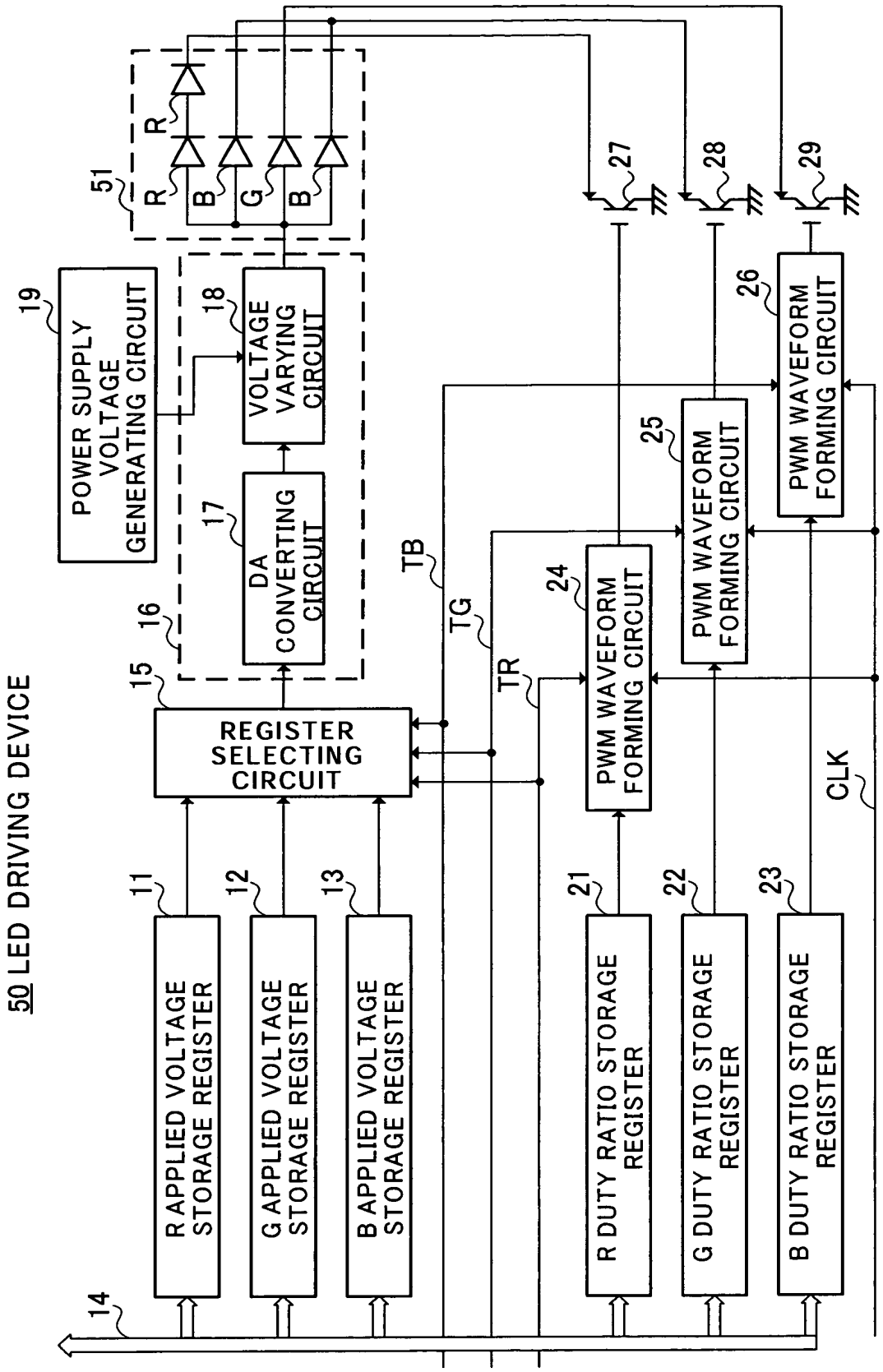
50 LED DRIVING DEVICE
R APPLIED VOLTAGE STORAGE REGISTER
G APPLIED VOLTAGE STORAGE REGISTER
B APPLIED VOLTAGE STORAGE REGISTER
R DUTY RATIO STORAGE REGISTER
G DUTY RATIO STORAGE REGISTER
B DUTY RATIO STORAGE REGISTER
REGISTER SELECTING CIRCUIT
DA CONVERTING CIRCUIT
VOLTAGE VARYING CIRCUIT
POWER SUPPLY VOLTAGE GENERATING CIRCUIT
PWM WAVEFORM FORMING CIRCUIT
PWM WAVEFORM FORMING CIRCUIT
PWM WAVEFORM FORMING CIRCUIT
TB
TG
TR
CLK
R
G
B
11
12
13
14
15
16
17
18
19
21
22
23
24
25
26
27
28
29
51

FIG.8

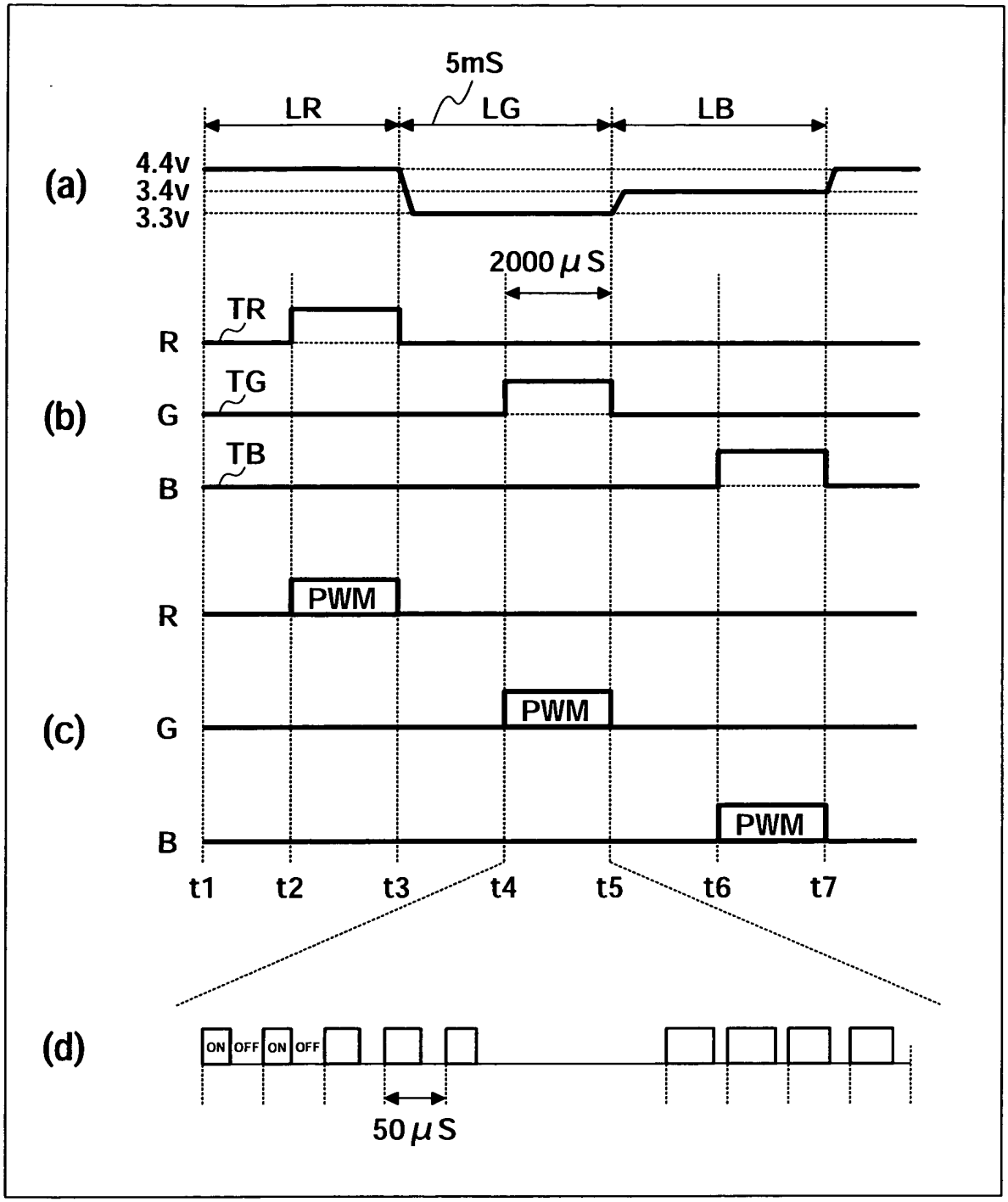
5mS
LR
LG
LB
(a)
4.4v
3.4v
3.3v
2000 μ S
TR
R
TG
(b)
G
TB
B
R
PWM
G
(c)
PWM
B
PWM
t1
t2
t3
t4
t5
t6
t7
(d)
ON
OFF
ON
OFF
50 μ S

FIG.9